DDT: The Good, the Bad, and the Unknown, with Brenda Eskenazi

Ernie Hood

DDT is unique among the "dirty dozen" compounds banned under the Stockholm Convention on Persistent Organic Pollutants because specific exceptions are made for the indoor spraying of this pesticide to control the mosquitoes that spread malaria. DDT is a cheap, effective weapon against the spread of this disease, which infects nearly 250 million people each year and kills nearly 1 million. However, little is known about the long-term human health effects of exposure to DDT in the context of indoor spraying. In this podcast, Brenda Eskenazi describes research issues surrounding the use of DDT to control disease vectors. Eskenazi is a member of the DDT Expert Group of the Stockholm Convention, and is the Maxwell Professor of Maternal and Child Health and Epidemiology and director of the Center for Children's Environmental Health Research at the University of California, Berkeley. She also is the first author of "The Pine River Statement: human health consequences of DDT use"

AHEARN: It's *The Researcher's Perspective.* I'm Ashley Ahearn.

The pesticide DDT has been banned in the United States[i] and most other developed countries for decades, in part because of concerns about its environmental and health effects. Yet in other countries,[ii] DDT is still widely used to kill malaria-bearing mosquitoes.

DDT is suspected of causing cancer and reproductive health problems.[iii] Even in countries where it has been long banned, this persistent organic pollutant continues to show up in the bodies of humans and animals. But DDT also is seen as a critical tool in fighting malaria, which infected an estimated 225 million people and killed 781,000 in 2009.[iv]

So, is DDT a necessary evil? Is the use of this pesticide the best method of protecting the health of millions until better alternatives are available?

To find out, science writer Ernie Hood turned to Dr. Brenda Eskenazi, director of the Center for Children's Environmental Health Research at the University of California, Berkeley. She's also a coauthor of the Pine River Statement, a review of the evidence to

date on the human health consequences of DDT exposure. Here, she tells Hood about the reviewers' conclusions, which were published in *EHP*.

ESKENAZI: I think most importantly is, as a group we were quite surprised by the paucity of information about exposures and health effects to DDT in countries that are currently being exposed to DDT because of current practices for malaria control. There were a number of papers that looked at health effects based on exposures that occurred either in the 1950s or 1960s in this country, in the United States, where levels were considerably higher than they are today, but where the exposures are probably much lower than they are in places where there is current application through indoor residual spraying. And in the few studies that have been done in Africa, the levels of exposure were tremendously higher than they were in the United States in the '50s, or currently in the United States, or for that matter elsewhere in the world where DDT is not used for indoor residual spraying.

HOOD: So what are the implications for the potential use of DDT today, given these drastically higher exposure levels you describe?

ESKENAZI: I think that's the rub—we really don't know. There are only a handful of studies that have looked at health outcomes associated with DDT exposures at the levels that we are seeing in places for example like South Africa and other countries where DDT is currently being used for malaria control. And I think that is the major conclusion of our paper—that we're concerned about the health of children and adults living in these communities, especially given the persistence of DDT and its metabolites in the environment and in the body, and the paucity of information we have about the health effects.

But on the other hand, we as a group also recognized the serious implications of restricting DDT use, because the sheer numbers of people that are dying from malaria, and of course most affected of those are the young children under the age of 5, so we really called for more information in countries that are being affected by malaria, and also where DDT is being used in the way that it's being used now.

HOOD: Dr. Eskenazi, do reasonable alternatives to DDT exist, or are there good ones in development at this time?

ESKENAZI: There are a number of alternatives that are being used. Probably the most frequently used is pyrethroids, where pyrethroids instead of DDT is being used for indoor residual spraying. There are other methods where bed nets are impregnated with pyrethroids, and just the bed nets are placed around the beds at night. These are extremely effective, but in some countries like South Africa, where DDT was replaced by pyrethroids for a brief period of time in some locations within South Africa, there was a surge in malaria cases, and because of that they returned to the use of DDT.

There are other possible means to control malaria—for example, integrative pest management, where they use biological methods to contain the mosquito larva. And there are new alternatives that are being developed, genetic means, and use of other biological agents (for example, fungi), that may be in the future more effective or at least as effective as DDT. But there need to be larger trials to determine whether they're really viable options.

HOOD: I see. So some of these new developments are still very much in the testing stage and not really ready for widespread use, but what about some of the alternatives you've just described? Why are they not being more widely used?

ESKENAZI: Well, DDT is easy to get, it's fairly cheap to use, and like I said earlier, in some countries like South Africa, pyrethroids may be less efficacious.

HOOD: Dr. Eskenazi, what is the current position of the Stockholm Convention[v] on this matter? And has it changed or evolved recently?

ESKENAZI: There was a meeting in the spring of 2009 where there was a change in the policy of the Stockholm Convention. The Conference of the Parties, which are comprised of different countries that are involved in the Stockholm Convention, allowed the use of DDT for public health interventions for disease vector control, but it recently endorsed, in 2009, a global initiative for the development and deployment of products and methods that would be alternative to DDT for disease vector control, and requested that the

Secretariat of the Stockholm Convention lead this implementation. They established a platform for joint leadership and for different countries to come together to work to the point, by 2020, to eliminate the use of DDT worldwide.

So there is a set plan, a timeline for different strategies and different goals, and to be accomplished by different years. To be more precise, by 2013 the Conference of the Parties was hoping to have developed strategies with suitable alternatives to DDT and to introduce these strategies globally. And by 2017 they want to stop all DDT production, with the goal of 2020 eliminating the use of DDT for disease vector control.

HOOD: So Dr. Eskenazi, do you anticipate that this goal of completely eliminating DDT use by 2020 worldwide will be accomplished? In your opinion, is it doable?

ESKENAZI: I think it's a goal that will be strived for, and that I hope that they can accomplish. Whether they'll be able to accomplish it is another story. One, there is nothing really binding about the Stockholm Convention, so that some countries may decide to continue to use DDT even though there may be health consequences that we don't know of yet. Two, we may not have viable alternatives that have been tested and have been shown to be efficacious.

In the meantime, we need to continue to bring to the public awareness what exposure levels people are having by living in communities where DDT is being used for indoor residual spraying, and what potential health consequences there may be. I believe we need to document exposures, document the health consequences, at the same time that we're looking for alternatives to DDT.

AHEARN: That was Dr. Brenda Eskenazi talking with science writer Ernie Hood. Dr. Eskenazi is the director of the Center for Children's Environmental Health Research at the University of California, Berkeley.

And that's *The Researcher's Perspective*. I'm Ashley Ahearn. Thanks for downloading!

References and Notes

i EPA. DDT Ban Takes Effect [EPA press release—December 31, 1972] [website]. Washington, DC:U.S. Environmental Protection Agency (updated 29 Mar 2011). Available: http://tinyurl.com/obuuen [accessed 31 Mar 2011].

ii Stockholm Convention. DDT Register Pursuant to Paragraph 1 of Part II of Annex B of the Stockholm Convention [website]. Geneva, Switzerland:Stockholm Convention Secretariat. Available: http://tinyurl.com/4ymn4nt [accessed 31 Mar 2011]. At the time of this recording 19 parties to the Stockholm Convention on persistent organic pollutants (POPs) had registered to produce and/or use DDT for disease vector control in accordance with the World Health Organization recommendations and guidelines.

iii Eskenazi B, et al. The Pine River statement: human health consequences of DDT use. Environ Health Perspect 117(9):1359–1367 (2009); doi:10.1289/ehp.11748.

iv WHO. World Malaria Report 2010. Geneva, Switzerland:World Health Organization (2010). Available: http://tinyurl.com/2egwshe [accessed 31 Mar 2011].

v The Stockholm Convention is a global treaty to restrict and ultimately eliminate the production, use, trade, release, and storage of long-lasting chemicals deemed highly dangerous to human health and the environment, including DDT. When the convention entered into force on 17 May 2004 it covered 12 compounds. An additional 9 compounds were added in 2009.

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